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REVIEW OF THE IMPLEMENTATION OF COMMITMENTS AND OF OTHER PROVISIONS OF THE CONVENTION

REVIEW OF INFORMATION COMMUNICATED UNDER ARTICLE 12

NATIONAL COMMUNICATIONS FROM PARTIES INCLUDED IN ANNEX I TO THE CONVENTION

Summary compilation of annual greenhouse gas emissions inventory data from Annex I Parties

Note by the secretariat

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I. INTRODUCTION

A. Mandate

1. The Conference of the Parties (COP), at its third session, requested the secretariat to collect, process and publish, on a regular basis, national greenhouse gas inventories submitted annually by Annex I Parties in accordance with decision 9/CP.2 (decision 6/CP.3). The COP further requested that, in those years when the compilation and synthesis of national communications is prepared, the annual inventory data submitted by Parties be included in that document. As only four Annex I Parties had submitted their national greenhouse gas inventories by 15 April 1998, the secretariat was unable to include this information in the second compilation and synthesis of second national communications (FCCC/CP/1998/11 and Add.1 and 2).

2. The Subsidiary Body for Implementation (SBI), at its eighth session in June 1998, urged Annex I Parties that had not already done so, to submit their annual national greenhouse gas (GHG) inventories, as soon as possible (FCCC/SBI/1998/6). The SBI further noted that the secretariat would provide a summary report to the SBI at its ninth session, in English only, based on national greenhouse gas inventories submitted by 30 September 1998.

B. Scope of the note

3. The present note is a summary compilation of the data on greenhouse gas emissions and removals for the period 1990 to 1996, as provided by 21 Annex I Parties in their annual national greenhouse gas inventories received by 15 October 1998. Due to the late submission of many of the inventories the present note provides an overview of the information and a full report will be prepared for the tenth session of the subsidiary bodies. In addition to providing the data in tabular format on greenhouse gas emissions and removals, this note highlights key trends and also considers the manner in which the information was reported, including issues such as timing of submissions, reporting formats used and completeness, consistency and comparability of the data.

C. Possible action by the SBI

4. The SBI may wish to consider this note with a view to assessing the process of reporting of greenhouse gas inventories. In view of the recurring delay by Parties in submitting national greenhouse gas inventories and the need to have complete, consistent and comparable results, the SBI may wish to recommend that the COP:

(a) Consider revising the date of submission of national inventory data on emissions by sources and removals by sinks on an annual basis from 15 April to 15 October, and request Parties, if possible, to submit data up to the year preceding the year of submission;

(b) Request Parties to provide the information electronically, as well as in printed form.

5. The SBI may wish to note the secretariat's intention to provide a report on the information contained in national inventory submissions for the tenth session of the subsidiary bodies. Noting the issues raised in this paper, and decision 6/CP.3, the SBI may further wish to request the secretariat to include in that report comparisons of the information with authoritative sources, as proposed in document FCCC/CP/1998/5.

6. The SBI may also wish to invite the Subsidiary Body for Scientific and Technological Advice (SBSTA) to take into account the issues raised in this paper as related to its ongoing methodological work on GHG inventories regarding the guidelines for the preparation of communications by Parties included in Annex I to the Convention. In particular the SBI may wish to invite SBSTA to provide clear guidance on how to report revisions to previously submitted inventory data and, in light of any possible revisions, the years for which inventories should be provided in annual submissions.

II. REPORTING ISSUES

A. Timing of submissions

7. Only four Parties submitted their national GHG inventories for the period 1990 to 1996 by the due date, 15 April 1998, and 17 more Parties submitted the information by 15 October 1998 (see box 1).

Box 1. Timing of submissions

Timing	Party
by 15 April 1998	Ireland, Netherlands, Switzerland, United Kingdom
by 15 May 1998	Austria, Czech Republic, Germany, New Zealand, Norway, Sweden
by 15 October 1998	Australia, Belgium, Canada, Denmark, France, Greece, Japan, Latvia, Monaco, Slovakia, United States

8. Some Parties submitted information in draft or preliminary form, or in parts, or submitted subsequent revisions to their inventories.

B. Completeness, consistency and comparability of data

9. The completeness of national GHG inventories has varied among Parties. Only 14 of the 21 reporting Parties provided data for the years 1990 to 1996, two Parties for 1995 and 1996,[1] and five Parties for 1996 only[2].

10. All Parties submitted information in accordance with the reporting format of the Intergovernmental Panel on Climate Change (IPCC) Guidelines for National GHG Inventories, although not for all years for which they reported, and some Parties used category classifications from earlier IPCC Guidelines.

11. Some Parties did not provide estimates for all gases or disaggregate information for all source categories. In a few cases the information was not complete for the entire period of years for which the Party reported.

12. The Guidelines request Parties to provide supplementary information to ensure adequate transparency. Of the 21 reporting Parties, 13 provided some information on emission factors and activity data used[3]. However, this information was not provided for all gases, source categories or years by the reporting Parties.

13. A particular problem was the reporting of information on hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6). Although 12 of the 16 Parties that reported information on one or more of these gases indicated whether reported emissions were actual or potential, seven Parties reported aggregate emissions for these gases and not by individual gas species, or reported emissions in carbon dioxide (CO_2) equivalent only[4]. For those Parties that provided aggregate emissions, the secretariat had to make assumptions as to the specific species of the gases when converting emissions to CO_2 equivalent (see table 6).

14. Fourteen of the 21 reporting Parties provided information in electronic format, although not all followed the IPCC reporting format completely. Provision of GHG inventories electronically in the IPCC format facilitates the processing and dissemination of this information.

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1 Ireland and Slovakia.

2 Czech Republic, Denmark, Latvia, Sweden and Switzerland.

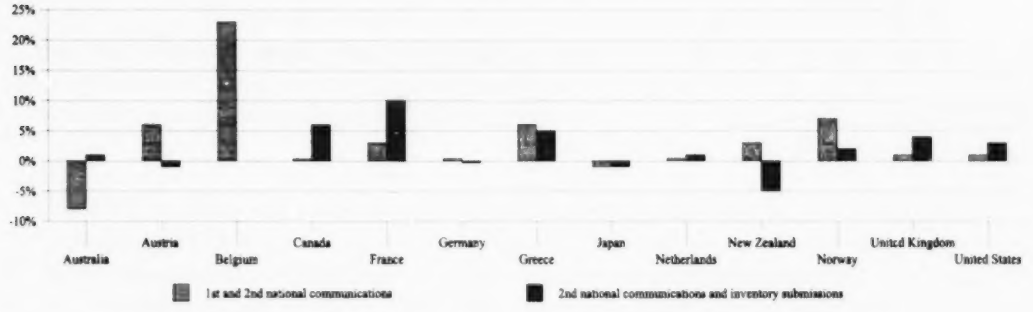
3 The following Parties did not provide information on activity data and emission factors in their annual inventory submission: Belgium, Czech Republic, Denmark, Ireland, Latvia, Netherlands and Norway.

4 Austria, Canada, Czech Republic, Denmark, Germany, Greece and Japan.

C. Changes in the 1990 inventory

15. Except for Belgium, all Parties that reported emissions for 1990 revised their estimates from earlier submissions. The change in aggregate emissions of CO_2, methane (CH_4) and nitrous oxide (N_2O) from second national communications ranged from 6 per cent lower to 10 per cent higher (see figure 1 and box 2)[5]. The inclusion of sources previously not considered was the most frequent reason for revisions; in particular, for several Parties, revisions were due to N_2O emissions from agriculture in accordance with the IPCC Guidelines (manure management and agricultural soils). However, use of revised activity data and emission factors was also noted. Only 10 Parties provided some explanation for the revisions to earlier estimates[6].

Figure 1. Changes in 1990 GHG emission inventories between first and second national communications and most recent inventory submissions



Box 2. Changes in 1990 GHG emission inventories between second national communications (1995) and most recent inventory submissions

	Aggregate GHG (CO_2, CH_4, N_2O)	CO_2	CH_4	N_2O
Australia	1	1	4	-5
Austria	-1	0	0	-21
Belgium	0	0	0	0
Canada	6	-1	3	121
France	10	3	0	70
Germany	0	0	-3	0
Greece	5	1	-1	73
Japan	-1	0	-2	-42
Netherlands	1	-4	17	25
New Zealand	-6	-1	-2	-22
Norway	2	0	2	20
United Kingdom	4	0	-1	79
United States	3	0	0	159

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5 The changes in 1990 estimates for Monaco are not given in figure 1 or box 2 since the earlier inventories were incomplete. For purposes of consistency and comparability, emissions of HFCs, PFCs and SF_6, and emissions/removals from land-use change and forestry are not considered in figure 1 or box 2.

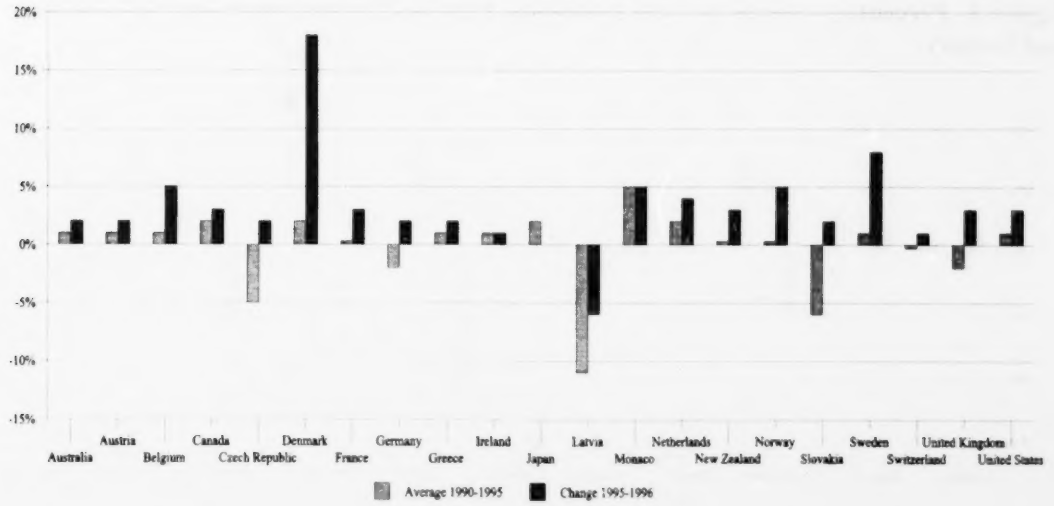
6 Australia, Austria, Canada, France, Greece, Netherlands, New Zealand, Norway, United Kingdom and United States.

16. Six Parties[7] revised earlier estimates of emissions and removals from land-use change and forestry, although explanations were not provided by all; revision of activity data or inclusion of additional sources or sinks were the main underlying causes. Australia and the United States reported the largest changes in estimates for land-use change and forestry, 32 per cent lower and 149 per cent higher, respectively. In the case of Australia this was due to revised estimates of emissions from land clearing and for the United States on account of inclusion of forest floor and soil carbon fluxes and inclusion of estimates related to harvests from public timberland which had previously not been considered.

III. EMISSION TRENDS, 1995-1996

17. Aggregate emissions have risen for all reporting Parties, except Latvia, from 1995 to 1996. The increasing trend in emission with the exclusion of land-use change and forestry is similar. The increase in aggregate emissions for 1995 to 1996 has been larger than the average annual increase in emissions over the period 1990-1995 (see figure 2).[8]

Figure 2. Annual average percentage change in GHG emissions (excluding land-use change and forestry) from 1990 to 1995 and percentage change from 1995 to 1996



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7 Australia, France, Japan, New Zealand, United Kingdom and United States.

8 The percentage change from 1995 to 1996 for the Czech Republic, Denmark, Latvia, Sweden and Switzerland may not be fully representative as these Parties submitted data only for 1996 and in order to present percentage change over time, data for 1990-1995 previously submitted in national communications or GHG inventories were used for the calculations.

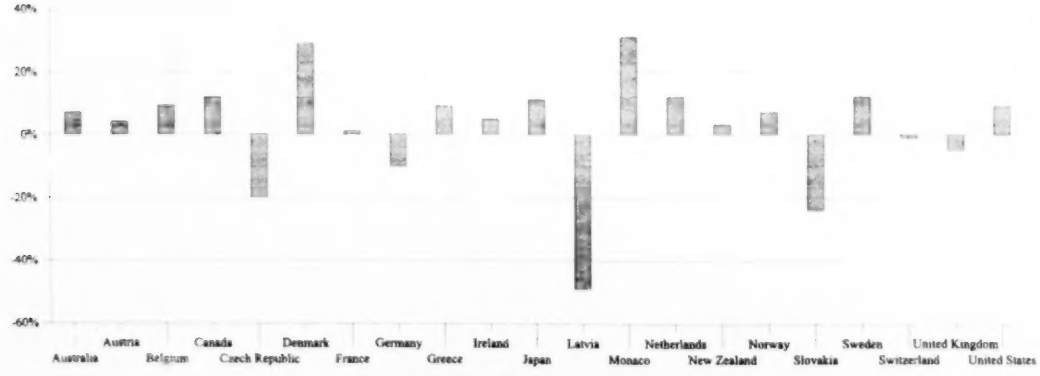
18. One of the larger sources of emissions, and the fastest growing, is transport. Emissions from transport (CO_2 and N_2O) increased from 1995 to 1996 for all Parties except four (Latvia, Monaco, Slovakia and Sweden).

19. Emissions of CO_2 increased for all Parties, except Latvia, from 1995 to 1996. Emissions of N_2O increased, except for Australia, Austria, Ireland, Latvia, New Zealand and Switzerland, where they decreased slightly or remained stable. Emissions of CH_4 continued to decrease or remained stable.

IV. GREENHOUSE GAS EMISSIONS AND REMOVALS, 1990-1996

20. There is a rising trend in aggregate GHG emissions (excluding the land-use change and forestry sector) for 15 of the reporting Parties from 1990 to 1996, the increases ranging from 3 to 31 per cent over the period (see figure 3 and table 1); five Parties (Czech Republic, Germany, Latvia, Slovakia, United Kingdom), representing approximately 13 per cent of aggregate GHG emissions from Annex I Parties, indicate a decline in emissions. There was no discernible trend in emissions for France and Switzerland, with emissions fluctuating either slightly above or below 1990 levels over the period.

Figure 3. Percentage change in GHG emissions, 1990 to 1996, excluding land-use change and forestry



21. The trend in aggregate GHG emissions with the inclusion of CO_2 emissions and removals from land-use change and forestry was similar, although the increase was notably smaller for some Parties (see table 2). For 8 of the 17 Parties that reported estimates from land-use change and forestry for the period 1990 to 1996, aggregate GHG emissions rose, the increases ranging from 2 to 19 per cent above 1990 levels; for six Parties emissions were lower and for Switzerland and France emissions were relatively stable over the period.

22. CO_2 emissions displayed a trend similar to that of aggregate GHG emissions. For 15 Parties CO_2 emissions increased from 1990 to 1996; for five Parties they decreased and for Switzerland they remained around levels of 1990. The most important category of CO_2 emissions was non-transport energy-related emissions, for most Parties constituting more than 70 per cent of CO_2 emissions in 1996 (see table 8). Emissions from transport were the second largest source of CO_2 emissions for most Parties, and for all Parties, except Latvia and Slovakia, emissions from transport increased from 1990 to 1996.

23. Information on CO_2 emissions and removals from the land-use change and forestry sector were reported by 19 of 21 Parties (see table 7) . For all but two reporting Parties (Australia and the United Kingdom) this sector constitutes a net sink. As well, for most Parties, the size of their sink increased over the period 1990 to 1996, and in the case of Australia and the United Kingdom, their net emissions from this sector decreased over the period. Canada, New Zealand, Sweden and the United States reported a decline in the size of their sink from 1990 to 1996.

24. Thirteen Parties' total CH_4 emissions showed a declining trend over the period 1990 to 1996 , six Parties indicated a rise in emissions over the period and for two Parties emissions fluctuated slightly above or below 1990 levels (see table 4). For 1996 the largest source of CH_4 emissions for 11 of the Parties was agriculture, contributing between 40 and 90 per cent of total CH_4 emissions. Emissions from waste and fugitive fuel were the largest source of emissions for six and three Parties, respectively (see table 9).

25. Eleven Parties indicated a rising trend in total N_2O emissions over the period 1990 to 1996, six Parties indicated a decline in emissions over the period and for four Parties emissions fluctuated slightly above or below 1990 levels (see table 5). The largest source of N_2O emissions in 1996 for all Parties except five was agriculture, contributing between 33 and 97 per cent of total N_2O emissions. For only three Parties were emissions from industrial processes the largest source of N_2O emissions, and for two Parties energy-related emissions were the largest source (see table 10).

26. The information reported on HFCs, PFCs and SF_6 indicates an increase in emissions for most Parties, except for PFCs, where some Parties reported a decline in emissions over the period 1990 to 1996 (see table 6). Data submitted on HFCs, PFCs and SF_6 were less consistent than for other gases; although 17 of 21 Parties reported information on at least one of these gases, data were not always provided for all years. In six cases, since information was provided in full mass of the gases without a disaggregation by species, the secretariat had to make certain assumptions as to the species of the gases in order to calculate CO_2 equivalents.

V. TABLES OF GREENHOUSE GAS EMISSIONS AND REMOVALS

27. Inventory data for the years 1990-1996 for individual Annex I Parties are presented in tables 1 to 10. Tables 3 to 5 contain information on the level of total emissions of the main GHGs , carbon dioxide, excluding the land-use change and forestry sector, methane and nitrous oxide, for 1990, 1995 and 1996 in mass units, the change in these emissions over the period 1991-1996 expressed in percentage relative to 1990, and the change in emissions from 1995 to 1996 expressed in percentage relative to 1995. Table 1 contains the same information for aggregate emissions of all greenhouse gases combined (expressed as CO_2 equivalent), excluding land-use change and forestry, and table 2, including land-use change and forestry. Table 6 provides information on emissions of HFCs, PFCs and SF_6 in CO_2 equivalent for 1990 and 1996 and table 7 presents data on CO_2 emissions and removals from the land-use change and forestry sector, and the change in emissions or removals from 1990 to 1996 expressed in percentage relative to 1990. Tables 8 to 10 provide disaggregated emissions of CO_2, CH_4 and N_2O by category for the years 1990 and 1996. For seven Parties the estimates given in tables 1 to 5 and 8 to 10 may not be fully accurate as Parties did not provide data for 1990 and all subsequent years, and in order to present the trend in emissions the secretariat used data previously submitted in national communications or GHG inventories. The footnotes to the tables indicate in which instances data from previous submissions were included.

Table 1. Aggregate emissions of greenhouse gases (CO_2 equivalent), 1990-1996, excluding land-use change and forestry (Gigagrams and percentage change by Party)

	Percentage relative to 1990, 1990=100									1996 to 1995 percentage 1995=100
	1990	1991	1992	1993	1994	1995	1996	1995	1996	
	(Gg)	%	%	%	%	%	%	(Gg)	(Gg)	%
Australia	415 656	100	101	101	102	105	107	435 471	445 840	102
Austria[a]	77 271	106	98	97	97	102	104	78 830	80 152	102
Belgium[a]	138 943	103	101	100	104	104	109	145 126	151 858	105
Canada	598 099	99	101	103	106	109	112	653 570	671 374	103
Czech Republic[ab]	192 130	92	85	82	78	79	80	150 912	153 579	102
Denmark[ab]	71 658	115	108	110	115	110	129	78 792	92 681	118
France	557 039	104	102	97	97	98	101	547 837	562 105	103
Germany	1 209 107	96	92	91	90	89	90	1 073 748	1 091 140	102
Greece	105 235	100	101	102	104	107	109	112 189	114 789	102
Ireland[ac]	56 861	99	100	100	103	104	105	59 324	59 722	101
Japan[d]	1 221 707	102	104	103	109	111		1 352 134		
Latvia[ab]	35 669	82	72	62	54	54	51	19 196	18 064	94
Monaco[a]	111	116	123	125	128	125	131	139	145	105
Netherlands	217 107	103	102	103	104	108	112	234 432	243 071	104
New Zealand	72 417	100	101	101	100	100	103	72 753	74 642	103
Norway	55 064	96	93	97	101	102	107	55 984	58 903	105
Slovakia[ac]	72 496	88	81	77	72	75	76	54 226	55 148	102
Sweden[ab]	65 101	99	101	101	104	103	112	67 176	72 723	108
Switzerland[ab]	53 749	103	101	98	97	98	99	52 763	53 416	101
United Kingdom	757 851	100	97	94	93	92	95	695 301	716 818	103
United States	5 999 122	99	101	103	105	106	109	6 349 340	6 557 050	103

[a] As estimates for HFCs, PFCs and SF_6 were not provided, or not provided for all years, estimates given here are for CO_2, CH_4 and N_2O only.

[b] As estimates for 1990-1995 were not provided in the inventory submission, data from the second national communication are used in this table. However, the trend shown here may not be fully accurate as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

[c] As estimates for 1990-1994 were not provided in the inventory submission, data from the second national communication are used in this table. However, the trend shown here may not be fully accurate as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

[d] Estimates were only provided for 1990-1995.

Table 2. Aggregate emissions of greenhouse gases (CO_2 equivalent), 1990-1996, including land-use change and forestry[a] (Gigagrams and percentage change by Party)

	Percentage relative to 1990, 1990=100									1996 to 1995 percentage 1995=100
	1990	1991	1992	1993	1994	1995	1996	1995	1996	
	(Gg)	%	%	%	%	%	%	(Gg)	(Gg)	%
Australia	474 529	99	98	98	97	100	102	472 615	482 100	102
Austria[b]	63 971	104	90	89	95	102	104	65 230	66 352	102
Belgium[b]	136 886	103	101	100	104	105	109	143 069	149 801	105
Canada	554 099	97	102	106	110	115	116	634 570	642 374	101
Czech Republic[bc]	189 849	91	83	80	77	77	79	145 458	149 100	103
Denmark[bc]	70 734	115	108	110	115	110	130	77 828	91 700	118
France	526 723	105	102	95	95	97	99	508 702	520 856	102
Germany	1 179 107	95	91	90	89	88	89	1 040 048	1 055 240	101
Greece[d]										
Ireland[bc]	51 701	98	100	99	10	103	103	53 094	53 225	100
Japan[f]	1 137 804	102	104	102	109	110		1 255 429		
Latvia[bc]	24 843	61	45	32	20	35	15	8 712	3 744	43
Monaco[d]										
Netherlands	215 607	103	103	103	104	108	112	232 732	241 371	104
New Zealand	51 104	102	107	109	110	110	114	56 285	58 112	103
Norway	45 474	91	83	87	88	93	91	42 344	41 292	98
Slovakia[bc]	68 239	88	80	75	69	72	73	49 110	49 867	102
Sweden[bc g]	30 933						132		40 427	
Switzerland[bc]	49 389	103	101	96	95	97	98	47 663	43 216	101
United Kingdom	778 058	100	97	93	92	91	94	706 775	728 117	103
United States	4 856 922	99	101	111	114	115	119	5 584 640	5 792 350	104

[a] Estimates for land-use change and forestry are as reported in accordance with the present IPCC Guidelines for National Greenhouse Gas Inventories (see table 7).

[b] As estimates for HFCs, PFCs and SF_6 were not provided, or not provided for all years, estimates given here are for CO_2, CH_4 and N_2O only.

[c] As estimates for 1990-1995 were not provided in the inventory submission, data from the second national communication are used in this table. However, the trend shown here may not be fully accurate as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

[d] As estimates were not provided for land-use change and forestry, figures are not given in this table.

[e] As estimates for 1990-1994 were not provided in the inventory submission, data from the second national communication are used in this table. However, the trend shown here may not be fully accurate as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

[f] Estimates were only provided for 1990-1995.

[g] Estimates from land-use change and forestry were only available for 1990 and 1996.

Table 3. Total anthropogenic CO_2 emissions, excluding land use change and forestry, 1990-1996 (Gigagrams and percentage change by Party)

	Percentage relative to 1990, 1990=100									1996 to 1995 percentage 1995=100
	1990	1991	1992	1993	1994	1995	1996	1995	1996	
	(Gg)	%	%	%	%	%	%	(Gg)	(Gg)	%
Australia	275 344	101	102	103	104	108	112	298301	308 413	103
Austria	62 100	108	98	96	97	102	105	63 600	65 000	102
Belgium	116 090	103	102	100	104	105	111	121 832	128 546	106
Canada	460 899	98	101	101	103	107	110	494 970	508 574	103
Czech Republic[a]	165 490	93	85	81	77	78	80	128 817	132 538	103
Denmark[a]	52 277	120	110	114	121	114	140	59 532	73 236	123
France	390 708	107	105	99	99	101	104	393 419	406 666	103
Germany	1 014 155	96	91	91	89	88	90	894 500	910 000	102
Greece	85 349	100	102	102	104	106	108	90 306	91 978	102
Ireland[b]	30 719	103	105	104	108	111	113	34 116	34 819	102
Japan	1 124 532	102	103	102	108	109	110	1 220 218	1 234 904	101
Latvia[a]	24 771	78	66	58	48	49	45	12 027	11 065	92
Monaco	108	116	123	125	128	125	131	135	141	105
Netherlands	161 360	103	102	104	104	110	115	176 910	184 870	104
New Zealand	25 241	102	110	107	107	107	115	27 033	29 008	107
Norway	35 457	95	97	101	107	108	116	38 123	41 073	108
Slovakia[b]	60 032	88	81	77	72	76	77	45 360	46 105	102
Sweden[a]	55 445	100	101	101	106	105	114	58 108	63 350	109
Switzerland[a]	45 070	104	101	98	96	98	100	44 170	44 970	102
United Kingdom	583 165	101	98	95	95	93	97	543 753	563 450	104
United States	4 943 300	99	100	103	104	105	109	5 203 500	5 393 800	104

a As estimates for 1990-1995 were not provided in the inventory submission, data from the second national communication are used in this table. However, the trend shown here may not be fully accurate as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

b As estimates for 1990-1994 were not provided in the inventory submission, data from the second national communication are used in this table. However, the trend shown here may not be fully accurate as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

Table 4. Total anthropogenic CH_4 emissions, 1990 - 1996 (Gigagrams and percentage change by Party)

	Percentage relative to 1990, 1990=100							1995	1996	1996 to 1995 percentage 1995=100
	1990	1991	1992	1993	1994	1995	1996	1995	1996	
	(Gg)	%	%	%	%	%	%	(Gg)	(Gg)	%
Australia	5 345	100	99	99	98	99	99	5 292	5 308	100
Austria	587	98	98	98	99	98	98	578	574	99
Belgium	634	99	99	100	100	94	93	594	591	99
Canada	3 300	103	106	112	115	118	121	3 900	4 000	103
Czech Republic[a]	888	92	87	82	80	83	65	733	573	78
Denmark[a]	421	101	102	106	102	102	101	430	425	99
France	3 018	99	97	95	93	92	90	2 786	2 712	97
Germany	5 522	93	92	89	87	86	86	4 734	4 724	100
Greece	437	100	100	101	103	104	105	454	457	101
Ireland[b]	811	98	99	99	99	100	99	814	800	98
Japan[c]	1 549	99	98	97	97	96		1 482		
Latvia[a]	186	98	81	56	52	54	50	101	93	92
Monaco[d]	~0							~0	~0	
Netherlands	1 292	101	97	95	93	91	91	1 173	1 179	101
New Zealand	1 673	98	96	96	96	96	95	1 601	1 593	99
Norway	442	100	103	103	107	111	110	492	485	99
Slovakia[b]	409	93	88	81	77	76	77	310	314	101
Sweden[a]	324	99	99	99	94	91	92	296	297	100
Switzerland[a]	244	100	99	99	97	97	94	235	228	97
United Kingdom	4 438	99	98	90	85	85	84	3 751	3 712	99
United States	29 628	101	102	101	104	106	105	31 334	31 138	99

[a] As estimates for 1990-1995 were not provided in the inventory submission, data from the second national communication are used in this table. However, the trend shown here may not be fully accurate as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

[b] As estimates for 1990-1994 were not provided in the inventory submission, data from the second national communication are used in this table. However, the trend shown here may not be fully accurate as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

[c] Estimates were only provided for 1990-1995.

[d] The trend in emissions is not shown here as estimates reported were approximately zero (0.05-0.06 Gg, 1990 to 1996).

Table 5. Total anthropogenic N_2O emissions, 1990-1996 (Gigagrams and percentage change by Party)

	Percentage relative to 1990, 1990=100									1996 to 1995 percentage 1995=100
	1990	1991	1992	1993	1994	1995	1996	1995	1996	
	(Gg)	%	%	%	%	%	%	(Gg)	(Gg)	%
Australia	74.9	101	101	103	103	106	105	79.4	78.9	99
Austria	9.2	103	103	105	108	109	109	10.0	10.0	100
Belgium	30.8	100	97	99	105	113	114	34.9	35.2	101
Canada	190.0	100	100	105	116	116	121	220.0	230.0	105
Czech Republic[a]	25.8	91	87	82	83	84	113	21.6	29.1	135
Denmark[a]	34.0	100	100	97	97	97	100	33.0	33.9	103
France	308.7	99	95	91	93	95	96	292.7	297.4	102
Germany	226.0	97	100	96	97	98	101	222.0	228.0	103
Greece	29.9	100	96	96	97	94	98	28.1	29.3	104
Ireland[b]	29.4	86	87	87	88	89	89	26.2	26.2	100
Japan[c]	61.0	96	96	99	100	103		62.7		
Latvia[a]	22.5	88	85	77	75	72	72	16.3	16.3	100
Monaco[d]	~0							~0	~0	
Netherlands	63.9	103	106	106	110	113	113	71.9	72.4	101
New Zealand	37.1	99	99	100	101	101	101	37.6	37.5	100
Norway	18.0	100	83	94	94	94	100	17.0	18.0	106
Slovakia[b]	12.5	87	72	57	58	61	63	7.6	7.9	104
Sweden[a]	9.2	100	96	100	103	100	110	9.2	10.1	110
Switzerland[a]	11.5	101	102	103	103	103	103	11.8	11.8	100
United Kingdom	215.0	97	86	81	88	85	88	183.3	189.3	103
United States	1 136.0	101	103	102	110	106	108	1 209.0	1 232.0	102

[a] As estimates for 1990-1995 were not provided in the inventory submission, data from the second national communication are used in this table. However, the trend shown here may not be fully accurate as the data from the national communication may not be consistent with data in the inventory submission due to factors such as the use of different methodologies or updated information.

[b] As estimates for 1990-1994 were not provided in the inventory submission, data from the second national communication are used in this table. However, the trend shown here may not be fully accurate as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

[c] Estimates were only provided for 1990-1995.

[d] The trend in emissions is not shown here as estimates reported were approximately zero (0.005-0.009 Gg, 1990 to 1996).

Table 6. Emissions of hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride (CO_2 equivalent), 1990 and 1996[a] (Gigagrams and percentage change by Party)

	HFCs			PFCs			SF_6			Total		
	1990	1996		1990	1996		1990	1996		1990	1996	
	Gg	Gg	%	Gg	Gg	%	Gg	Gg	%	Gg	Gg	%
Australia				4 860	1 484	-69		15		4 860	1 499	-69
Austria[a]		712			68			789			1 568	
Belgium		533			73		333	333	0	333	939	182
Canada		500		6 000	6 000	0	3 000	1 000	-67	9 000	7 500	-17
Czech Republic[a]		222			4			183			409	
Denmark[a]		300			3			134			436	
France	2 250	2 325	3	2 602	1 261	-52	2 414	2 701	12	7 266	6 287	-13
Germany[a]	2 340	3 759	61	2 694	1 617	-40	3 896	5 879	51	8 930	11 256	26
Greece	935	3 746	301	503	385	-23				1 438	4 131	187
Ireland[b]												
Japan[a]	2 080	16 250	681	5 416	14 894	175	38 240	52 580	38	45 736	83 724	83
Latvia[b]												
Monaco[b]												
Netherlands	4 900	7 200	47	2 500	2 300	-8	1 400	1 500	7	8 800	11 000	25
New Zealand[a]		297		519	237	-54	25	25	0	544	560	3
Norway	0	268		2 546	1 271	-50	2 199	526	-76	4 745	2 065	-56
Slovakia					320						320	
Sweden[b]												
Switzerland		413			24			72			508	
United Kingdom[a]	12 180	15 358	26	2 085	535	-74	574	837	46	14 838	16 730	13
United States[c]	35 809	66 824	87	18 003	17 951	0	26 768	35 372	32	81 474	127 349	56

[a] The estimates provided in this table are in many cases approximate, as Parties provided emissions of HFCs and for PFCs on an aggregate basis and the secretariat had to make assumptions as to the species of the gases to calculate emissions in CO_2 equivalent. The secretariat based the estimates to the extent possible on information provided is previously submitted inventories.

[b] Estimates were not provided for these gases.

[c] The totals for the three separate gases do not equal the overall total owing to the inclusion of emissions from some sources that were not disaggregated to the three separate gases.

Table 7. Anthropogenic CO_2 emissions and removals from land-use change and forestry, 1990-1996 (Gigagrams and percentage change by Party)[a]

	1990	1991	1992	1993	1994	1995	1996	Percentage change in emissions or removals from 1990 to 1996
	(Gg)	(Gg)	(Gg)	(Gg)	(Gg)	(Gg)	(Gg)	%
Australia	58 873	50 752	46 980	44 672	38 161	37 144	36 260	38
Austria	-13 300	-15 300	-17 900	-17 800	-14 700	-13 600	-13 800	4
Belgium	-2 057	-2 057	-2 057	-2 057	-2 057	-2 057	-2 057	0
Canada	-44 000	-53 000	-43 000	-31 000	-26 000	-19 000	-29 000	-34
Czech Republic[b]	-2 281	-5 027	-6 041	-5 643	-3 943	-5 454	-4 479	96
Denmark[b]	-924	-932	-940	-948	-956	-964	-981	6
France	-30 316	-27 428	-31 358	-37 852	-40 515	-39 135	-41 249	36
Germany	-30 000	-39 600	-40 700	-40 700	-32 600	-33 700	-35 900	20
Greece[c]								
Ireland[d]	-5 160	-5 390	-5 580	-5 760	-5 970	-6 230	-6 497	26
Japan[e]	-83 903	-83 865	-85 568	-90 084	-93 545	-96 705		15
Latvia[b]	-10 826	-14 186	-14 235	-14 228	-14 206	-10 484	-14 320	32
Monaco[c]								
Netherlands	-1 500	-1 600	1 600	-1 600	-1 700	-1 700	-1 700	13
New Zealand	-21 313	-20 199	-18 541	-16 940	-16 404	-16 468	-16 530	-22
Norway	-9 590	-11 700	-13 250	-13 510	-15 680	-13 640	-17 611	84
Slovakia[d]	-4 257	-4 257	-4 257	-4 257	-5 118	-5 116	-5 281	24
Sweden[bf]	-34 368						-32 296	-6
Switzerland[b]	-4 360	-4 380	-4 430	-5 160	-5 150	-5 100	-5 200	19
United Kingdom	20 207	19 437	18 297	16 355	12 314	11 474	11 299	44
United States	-1 142 200	-1 142 200	-1 142 200	-764 700	-764 700	-764 700	-764 683	-33

a Estimates for land-use change and forestry are as reported in accordance with the present IPCC Guidelines for National Greenhouse Gas Inventories. In this table negative values in gigagrams indicate net removal of CO_2 from the land-use change and forestry category; negative values in percentage represent less removals in 1996 than in 1990 and positive values indicate more removals (or less emissions in the case of Australia and the United Kingdom) in 1996 than in 1990.

b As estimates for 1990-1995 were not provided in the inventory submission, data from the second national communication are used in this table. However, the trend shown here may not be fully accurate as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

c Estimates were not provided for land-use change and forestry.

d As estimates for 1990-1994 were not provided in the inventory submission, data from the second national communication are used in this table. However, the trend shown here may not be fully accurate as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

e Percentage change in removals are from 1990 to 1995.

f Estimates were only available for 1990 and 1996.

Table 8. Anthropogenic CO_2 emissions by source category, excluding land-use change and forestry, 1990 and 1996 (Gigagrams and percentage of total by Party)

	Energy (excl transport)				Transport				Industrial processes				Total	
	1990		1996		1990		1996		1990		1996		1990	1996
	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	(Gg)
Australia	209 093	75.9	234 050	75.9	59 596	21.6	67 240	21.8	6 655	2.4	7 110	2.3	275 344	308 413
Austria	34 900	56.2	37 800	58.2	13 900	22.4	15 700	24.2	12 700	20.5	10 900	16.8	62 100	65 000
Belgium	85 955	74.0	93 680	72.9	19 964	17.2	22 389	17.4	9 188	7.9	11 287	8.8	116 090	128 546
Canada	274 780	59.6	300 400	59.1	147 000	31.9	167 000	32.8	31 900	6.9	39 200	7.7	460 899	508 574
Czech Republic[a]	152 114	91.9	119 696	90.3	7 959	4.8	9 896	7.5	5 417	3.3	2 479	1.9	165 490	132 538
Denmark[a]	40 664	77.8	60 036	82.0	10 474	20.0	11 748	16.0	1 006	1.9	1 388	1.9	52 277	73 236
France	241 380	61.8	248 348	61.1	123 111	31.5	135 368	33.3	20 948	5.4	17 313	4.3	390 708	406 666
Germany	824 256	81.3	712 000	78.2	162 231	16.0	173 000	19.0	27 668	2.7	25 000	2.7	1 014 155	910 000
Greece	62 086	72.7	66 329	72.1	15 170	17.8	17 253	18.8	7 804	9.1	8 111	8.8	85 349	91 978
Ireland[a]	24 153	78.6	26 489	76.1	4 885	15.9	6 538	18.8	1 627	5.3	1 738	5.0	30 719	34 819
Japan	845 533	75.2	903 558	73.2	207 431	18.4	248 576	20.1	58 795	5.2	61 093	4.9	1 124 532	1 234 904
Latvia[a]	18 380	74.2	9 263	83.7	5 829	23.5	1 612	14.6	563	2.3	185	1.7	24 771	11 065
Monaco	67	61.6	91	64.4	39	36.5	47	33.1					108	141
Netherlands	129 390	80.2	148 500	80.3	28 560	17.7	33 370	18.1	1 880	1.2	1 740	0.9	161 360	184 870
New Zealand	14 210	56.3	15 294	52.7	8 645	34.2	10 972	37.8	2 386	9.5	2 742	9.5	25 241	29 008
Norway	14 723	41.5	18 254	44.4	13 885	39.2	15 508	37.8	6 694	18.9	7 163	17.4	35 457	41 073
Slovakia[a]	51 417	85.6	38 940	84.5	5 168	8.6	4 164	9.0	3 447	5.7	3 001	6.5	60 032	46 105
Sweden[a]	32 732	59.0	39 817	62.9	18 650	33.6	19 573	30.9	3 787	6.8	3 711	5.9	55 445	63 350
Switzerland[a]	25 718	57.1	26 460	58.8	14 668	32.5	14 910	33.2	3 363	7.5	2 200	4 9	45 070	44 970
United Kingdom	452 689	77.6	429 486	76.2	115 901	19.9	121 882	21.6	13 916	2.4	11 703	2.1	583 165	563 450
United States	3 389 700	68.6	3 699 483	68.6	1 499 100	30.3	1 631 090	30.2	54 500	1.1	63 309	1.2	4 943 300	5 393 883

[a] As estimates for 1990 were not provided in the inventory submission, data from the second national communication are used in this table. However, the comparison of 1990 and 1996 data may not be fully consistent as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

Table 9. Anthropogenic CH_4 emissions by source category, 1990 and 1996 (Gigagrams and percentage of total by Party)

	Fugitive fuel				Agriculture				Waste				Total	
	1990		1996		1990		1996		1990		1996		1990	1996
	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	(Gg)
Australia	1 108	20.7	1 143	21.5	3 200	59.9	3 096	58.3	704	13.2	794	15	5 345	5 308
Austria	4	0.7	6	1	208	35.5	207	36	227	38.7	218	38	587	574
Belgium	53	8.4	34	5.7	388	61.2	354	60	174	27.4	186	31.5	634	591
Canada	1 200	36.4	1 700	42.5	950	28.8	1 100	27.5	850	25.8	940	23.5	3 300	4 000
Czech Republic[a]	460	51.8	301	52.5	204	23	134	23.4	149	16.7	97	17	888	573
Denmark[a]	12	2.9	17	4.1	329	78.1	321	75.5	71	16.9	73	17.2	421	425
France	311	10.3	263	9.7	1 630	54	1 565	57.7	815	27	607	22.4	3018	2 712
Germany	1 560	28.3	1 155	24.4	1 887	34.2	1 547	32.7	1 870	33.9	1 900	40.2	5522	4 724
Greece	44	10.1	51	11.1	271	61.9	280	61.2	109	24.9	113	24.6	437	457
Ireland[a]	10	1.3	12	1.5	640	78.9	655	81.9	136	16.8	102	12.8	811	800
Japan	166	10.7			842	54.4			394	25.4			1 549	
Latvia[a]	53	28.6	19	20.2	111	59.7	42	45	19	10.4	26	28.1	186	93
Monaco[b]									~0	44.2	~0	38.3	~0	~0
Netherlands	179	13.8	192	16.3	505	39.1	476	40.4	568	44	466	39.5	1 292	1 179
New Zealand	25	1.5	31	2	1 492	89.2	1 431	89.8	141	8.4	114	7.2	1 673	1 593
Norway	20	4.5	27	5.6	102	23.1	109	22.5	302	68.3	327	67.4	442	485
Slovakia[a]	122	29.8	119	37.9	187	45.7	109	34.7	65	15.9	69	22	409	314
Sweden[a]					200	61.7	198	66.7	85	26.2	61	20.5	324	297
Switzerland[a]	15	6	13	5.6	151	62	142	62.4	69	28.2	66	28.7	244	228
United Kingdom	1 319	29.7	800	21.6	1 090	24.6	1 064	28.7	1 923	43.3	1 754	47.3	4 438	3 712
United States	10 172	34.3	9 471	30.4	8 700	29.4	9 300	29.9	10 000	33.8	11 600	37.3	29 628	31 138

[a] As estimates for 1990 were not provided in the inventory submission, data from the second national communication are used in this table. However, the comparison of 1990 and 1996 data may not be fully consistent as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

[b] Estimates reported were approximately zero (total 1990 and 1996, 0.05 and 0.06 Gg).

Table 10. Anthropogenic N_2O emissions by source category, 1990 and 1996 (Gigagrams and percentage of total by Party)

	Energy				Industrial processes				Agriculture				Total	
	1990		1996		1990		1996		1990		1996		1990	1996
	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	%	(Gg)	(Gg)
Australia	7.8	10.5	13.5	17.1	1.6	2.2	1.6	2.0	63.0	84.1	62.0	78.6	74.9	78.9
Austria	1.9	20.7	2.8	28.0	0.6	6.5	0.5	5.0	3.3	35.9	3.3	33.0	9.2	10.0
Belgium	8.3	26.9	8.6	24.4	11.5	37.3	14.0	39.9	10.9	35.4	9.8	27.9	30.8	35.2
Canada	37.0	19.5	59.0	25.7	37.0	19.5	40.0	17.4	110.0	57.9	130.0	56.5	190.0	230.0
Czech Republic[a]	20.0	77.5	4.2	14.3	3.3	12.8	3.3	11.5	2.3	8.9	20.6	70.8	25.8	29.1
Denmark[a]	2.0	5.9	3.1	9.0					33.0	97.1	30.2	89.1	34.0	33.9
France	14.9	4.8	19.3	6.5	90.0	29.2	81.1	27.2	181.1	58.7	173.7	58.4	308.7	297.4
Germany	37.0	16.4	46.0	20.2	83.0	36.7	87.0	38.2	96.0	42.5	85.0	37.3	226.0	228.0
Greece	6.7	22.4	7.8	26.6	2.3	7.7	1.8	6.1	20.6	68.9	19.5	66.6	29.9	29.3
Ireland[a]	2.8	9.4	3.7	14.0	2.6	8.9	2.6	10.0	23.3	79.5	19.0	72.6	29.4	26.2
Japan	22.1	36.2			23.8	39.0			9.3	15.2			61.0	
Latvia[a]	0.3	1.2	0.4	2.3					22.0	97.6	15.6	96.1	22.5	16.3
Monaco[b]	~0	60.0	~0	66.7									~0	~0
Netherlands	5.3	8.3	8.5	11.7	31.5	49.3	31.6	43.6	22.2	34.7	27.5	38.0	63.9	72.4
New Zealand	0.6	1.6	0.7	1.9					36.3	97.7	36.5	97.4	37.1	37.5
Norway	2.0	11.1	3.0	16.7	7.0	38.9	5.0	27.8	9.0	50.0	9.0	50.0	18.0	18.0
Slovakia[a]	0.6	4.8	0.9	11.4	2.1	16.8	1.1	13.9	9.5	76.0	5.5	69.6	12.5	7.9
Sweden[a]	6.3	68.5	7.1	70.3	2.7	29.3	2.8	27.7	0.2	2.2	0.2	2.0	9.2	10.1
Switzerland[a]	1.4	12.1	2.1	17.8	0.3	2.8	0.3	2.6	9.2	80.1	8.7	73.7	11.5	11.8
United Kingdom	15.5	7.2	20.5	10.8	95.3	44.3	70.3	37.1	103.8	48.3	98.3	51.9	215.0	189.3
United States	244.0	21.5	248.0	20.1	96.0	8.5	108.0	8.8	770.0	67.8	848.0	68.8	1 136.0	1 232.0

[a] As estimates for 1990 were not provided in the inventory submission, data from the second national communication are used in this table. However, the comparison of 1990 and 1996 data may not be fully consistent as the data from the national communication may not be consistent with data in the inventory submission because of factors such as the use of different methodologies or updated information.

[b] Estimates reported were approximately zero (total 1990 and 1996, 0.005 and 0.009 Gg).

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